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20 February 1993

GRANT
NN-90-CR
176495

FINAL REPORT
GRANT NAG 5-357

P-3

The research supported by this grant has focussed on two related questions pertaining to the physics of hot stars: (1) the occurrence of silicon overabundance among B-stars of the Orion OB1 and Scorpius OB2 associations and (2) the occurrence and dynamics of radiatively driven but magnetically controlled stellar winds on helium peculiar main sequence B-stars.

(1) Statistical analysis of the Orion and Scorpius observations is near completion. A paper describing the results will be submitted to the Astronomical Journal.

(2) In our last paper devoted in this series, "Magnetically Controlled Circumstellar Matter in the Helium-Strong Stars" (Ap.J. 365, 665), we developed synthetic photometric indices that greatly facilitated our determination of configuration of trapped plasma around these objects. Application of this technique to our spectra of helium-weak stars has revealed that two of these objects show weak but unambiguous evidence of trapped circumstellar material. These two stars, HD 144334 and HD 142990, have both been detected at radio frequencies. The discovery of trapped plasma around these two stars confutes the taxonomic role of the sn optical spectral morphology common to all previously identified examples of this phenomenology in the helium-weak temperature range.

Additionally, we have succeeded in accounting for the available observations of the helium-strong star HD 184927 in terms of the model previously employed for all other members of the class for which adequate IUE observations have been obtained. Our previous suggestion that the star is a rapid rotator appears unlikely. It now appears that the observations of C IV variations in the spectra of helium-strong and helium-weak stars, when present, can be explained with a single model for magnetically trapped circumstellar plasma. A paper describing these new results, likely the last in our long series, will shortly be submitted to the Astronomical Journal.

A third focus of effort supported by this grant is a study of the spatial variation of ultraviolet extinction in the Orion OB1 association. Analysis of the observations has not yet revealed statistically significant variations.

A list of papers reporting work done in connection with this grant is appended.

Douglas N. Brown
Erika Böhm

PUBLICATIONS IN PRINT

Journal Articles:

Shore, S.N. and Brown, D.N. 1990 "Magnetically-Controlled Circumstellar Material in the Helium Strong Stars." *Astrophysical Journal,* **365**, 665.

Shore, S.N., Brown, D.N., Sonneborn, G., Landstreet, J.D. and Bohlender, D. 1990, "The Discovery of Magnetically-Controlled Circumstellar Matter in the Helium Weak Stars, HD 5737 and HD 79158." *Astrophysical Journal,* **348**, 242.

Shore, S.N. and Brown, D.N. 1988, "Colliding Stellar Winds in the Eclipsing Wolf-Rayet Binary, V444 Cygni." *Astrophysical Journal,* **334**, 1027

Shore, S.N. and Brown, D.N. 1987, "The *sn* Stars: Magnetically Controlled Stellar Winds Among the Helium-Weak Stars." *Astronomical Journal,* **94**, 737.

Bohlender, D.A., Brown, D.N. Landstreet, J.D. and Thompson, I.B. 1987, "Magnetic Field Measurements of Helium-Strong Stars." *Astrophysical Journal,* **323**, 325.

Shore, S.N. and Brown, D.N. 1987, "IUE Observations of the Broad Continuum Feature at 1400 A in the Silicon and Related Stars." *Astronomy and Astrophysics,* **184**, 219.

Shore, S.N., Brown, D.N., Sonneborn, G., and Gibson, D. 1987, "The Rapid Magnetic Pulsators: a New Probe of Chromospheric Heating Mechanisms", *Astronomy and Astrophysics,* **182**, 285.

Brown, D.N., Shore, S.N. and Sonneborn, G. 1985, "The Magnetically Controlled Stellar Wind of HD 21699", *Astronomical Journal,* **90**, 1354.

Conference Papers:

Shore, S.N., Brown, D.N. and Sonneborn, G. 1988, "The Discovery of a Co-rotating Magnetosphere in a Helium-Weak Star: HD 5737." *A Decade of UV Astronomy with the IUE Satellite.* ESA SP-281, Vol. I., p. 339.

Sonneborn, G., Shore, S.N. and Brown, D.N. 1988, "The Small Scale Structure of the Interstellar Medium in the Orion Association: the Flotsam of Star Formation." *A Decade of UV Astronomy with the IUE Satellite.* ESA SP-281, Vol. II., p. 231.

Brown, D.N. and Shore, S.N. 1986, "Doppler Tomography of the Stellar Wind of the Wolf-Rayet Binary Star V444 Cygni. " in *New Insights in Astrophysics: Eight Years of UV Astronomy,* European Space Agency, SP-263, p. 347.

Shore, S.N. and Brown, D.N. 1986, "IUE Observations of Magnetically Controlled Stellar Winds in the Helium-Peculiar Stars." in *New Insights in Astrophysics, p.* 361.

Brown, D.N. and Shore, S.N. 1986, "A λ1400 Spectrophotometric Census of the Orion Belt Region. " in *New Insights in Astrophysics, p.* 365.

Brown, D.N., Shore, S.N., Bolton, C.T., Hulbert, S.J., Sonneborn, G. 1984, "Ultraviolet and Optical Spectroscopy and Polarimetry of the Helium-Weak Star HD 21699: Evidence for a Magnetically Controlled Stellar Wind", in *The Future of Ultraviolet Astronomy: Six Years of IUE Research,* NASA CP-2238, p.483.

Brown, D.N., Shore, S.N., Barker, P.K. and Sonneborn, G. 1984, "Magnetospheres and Winds in the Helium-Weak Stars", in *The Future of Ultraviolet Astronomy: Six Years of IUE Research,* p.487.

Shore, S.N. and Brown, D.N., 1984, "IUE Spectrophotometry of the Helium-Weak and Silicon Stars", in *The Future of Ultraviolet Astronomy,* p.491.

Barker, P.K., Brown D.N., Landstreet, J.D., and Shore, S.N. 1982, "IUE Observations of Upper Main Sequence Helium Rich Stars", *Bull. Amer. Astron. Soc.,* **14**, 651.

Barker, P.K., Brown, D.N., Bolton, C.T., and Landstreet, J.D. 1982, "Magnetospheres and Winds of the Helium Strong Stars: Dependence on Rotation", in *Advances in Ultraviolet Astronomy,* p.589.

PUBLICATIONS IN PREPARATION

Brown, D.N. and Shore, S.N., 1992,
"The Silicon Stars of the Orion OBl Association: A λ1400 Census"

Brown, D.N., Bolton, C.T., Shore, S.N., and Landstreet, J.D. 1992,
"The Magnetospheres Helium Peculiar Stars, HD 184927, HD 144334 and HD 142990"